REMARKS

Claims 3 and 15-18 are canceled herein. Upon entry of the amendment claims 4, 6-13 and 24-34 will be all the claims pending. No issues of new matter are presented.

I. Rejections Under 35 U.S.C. § 112, 2nd Paragraph

1. Claims 3, 4, 6, 7, 8, 9, 11, 12, 13, 24, 25, 26, 27 28, 29, 32, and 34 are rejected under 35 U.S.C. 112, second paragraph, as allegedly being indefinite. Specifically, the Examiner states that all of the rejected claims start with the article "A process" and it is not clear if such claims are directed to a new process or only present further limitations to the process outlined in the independent claims from which each claim depends.

Applicants submit that the rejection is based upon a matter of form which is not a proper basis for rejection under 35 U.S.C. § 112, 2nd paragraph. In view thereof, Applicants view the Examiner's rejection as an objection to format and amend claims 4, 6-9, 11-13, 24-29, 32 and 34 herein to recite "The process" in an effort to facilitate and expedite prosecution of the present application and not for reasons of patentability. Claim 3 is canceled herein and therefore the rejection as to claim 3 is moot. Accordingly, Applicants formally request withdrawal of the rejection.

2. Claims 24, 25, 26 and 27 are rejected under 35 USC § 112 as indefinite because they depend from claims 19 and 20, which have been canceled.

Claims 24 and 25 are amended herein to depend on claim 31, and claims 25 and 26 are amended herein to depend on claim 33, thereby obviating the rejection. Accordingly, Applicants respectfully request withdrawal of the rejection.

3. Claims 10, 30, 31 and 33 are rejected under 35 U.S.C. 112, second paragraph, as allegedly being indefinite for the following reasons:

a) Claim 10:

The Examiner states that the phrase "as to produce a hydrogenated ester corresponding to the allyl-type ester" is not clear because if a hydrogenation took place through the claimed process, then the product is no longer an "allyl-type ester" because there is no allyl group present in the product.

Applicants respectfully traverse the rejection. In the present specification, on page 1, the term ("corresponding") hydrogenated ester" is defined as "an ester which is obtainable by hydrogenating the entirety of a portion of the unsaturated moiety of the unsaturated group-containing ester to be used as a raw material". Further, the term "hydrogenated ester" is said to naturally refer to a generally named "saturated ester". (Specification, page 2, lines 2-3). It is also explained that

> "when a plurality of unsaturated groups are present in the unsaturated group-containing ester as the raw material, this term not only includes a product (so-called "saturated ester") which has been obtained by hydrogenating all of the unsaturated groups of the unsaturated group-containing ester, but also includes a product which has been obtained by hydrogenating a portion of the unsaturated groups of the unsaturated group-containing ester and mixtures of those saturated ester(s) and unsaturated ester(s)." Specification, page 2, lines 3-13.

Thus, when read in light of the specification, one of ordinary skill in the art would understand that the phrase refers to a "hydrogenated ester" product which corresponds to, or results from hydrogenation of the allyl-type ester. However, in an effort to facilitate and expedite prosecution, Applicants have amended claim 10 herein to recite "so as to

produce the corresponding hydrogenated ester", and not for reasons of patentability. Accordingly, Applicants respectfully request withdrawal of the rejection.

b) Claim 30:

1. The Examiner states that the phrase "to produce a hydrogenated ester corresponding to the unsaturated group-containing ester" is confusing because it simultaneously describes the product obtained as unsaturated and saturated. The Examiner further questions what is the real product obtained.

Applicants respectfully traverse this ground for rejection on the basis that when read in light of the specification, one of ordinary skill in the art would recognize that the phrase refers to a "hydrogenated ester" product which corresponds to, or which would result from the reaction with an "unsaturated group-containing ester" as the starting material. However, in an effort to facilitate and expedite prosecution, Applicants have amended claim 30 herein to recite "so as to produce the corresponding hydrogenated ester" and not for reasons of patentability.

2. The Examiner states "in the description of the general formula (1) any of the groups R^1 to R^5 can be 'an arbitrary alkenyl group containing 1 to 10 carbon atoms; however, the possibility of an 'alkenyl group' having only one carbon atom is unknown in the art. The Examiner further asserts that it is not clear if the alkenyl group present as any of the substituents R^1 to R^5 is also reduced during the hydrogenation process or if only the alkenyl group reduced or hydrogenated is the one next to or in an allyl position to the ester functional group to obtain the claimed " hydrogenated ester" product.

Applicants respectfully traverse the rejection and refer the Examiner to the quoted portion of the specification above which explains what happens when there are multiple unsaturated

groups in the starting material. Additionally, the alkenyl group in the raw material can also be hydrogenated by hydrogen depending on the reaction conditions. Thus, when read in light of the specification, one of ordinary skill in the art would be able to determine the scope of the claim. Further, Applicants have amended claim 30 herein to recite "an arbitrary alkenyl group containing 2 – 10 carbon atoms" to remove any ambiguity in the claim language. Accordingly, Applicants respectfully request withdrawal of the rejection.

3. The Examiner states that the phrase "reacting the unsaturated group containing ester by diluting said unsaturated group-containing ester with an inert solvent to effectuate a hydrogenation reaction" is not clear. The Examiner questions whether dilution of the substrate is the only requirement needed in order for the claimed process to take place.

Applicants respectfully submit that the present invention relates to a process for producing a hydrogenated ester by hydrogenating an unsaturated group-containing ester of a specific formula (1) in the presence of a hydrogenating catalyst so as to produce a corresponding hydrogenated ester, comprising:

providing an unsaturated group-containing ester (1) wherein the concentration of the unsaturated group-containing ester of formula (1) at the initial time of the hydrogenation reaction thereof is in the range of 1 wt% - 50 wt% based on the entirely of the raw material liquid; and

reacting the unsaturated group-containing ester by diluting unsaturated group-containing ester with an inert solvent, wherein the inert solvent is the corresponding hydrogenated ester.

In the process of producing a hydrogenated ester according to the present invention, a hydrogenated ester (particularly, a saturated ester) can be industrially produced while

maintaining the resultant raw material conversion, selectivity factor, and yield at a high level. In the present invention, a complicated reaction apparatus or reaction process is not necessarily required.

Further, according to the present invention, saturated ester can be industrially produced at a low cost by conducting a hydrogenation reaction in a liquid phase by use of a hydrogenating catalyst commonly used, and by use of a raw material liquid which has been obtained by diluting an unsaturated group-containing ester with a solvent inert to the hydrogenation reaction (page 75, line 27 to page 75, line 4 of the present specification).

In addition, in the present invention, the inert solvent is the corresponding hydrogenated ester, i.e., the inert solvent is the recycled product. Accordingly, in the present invention, the process required for removing the solvent for the hydrogenation reaction can be substantially omitted, and the costs and energy required for the production of the hydrogenated ester can be reduced markedly.

Therefore, all elements recited in the claim are part of the inventive process. Accordingly, Applicants respectfully request withdrawal of the rejection.

c) Claim 33:

1. The Examiner states that the phrase "wherein at least one species" is confusing since singular and plural terms are being used in a confusing manner and questions whether "wherein at least one of the species" is the intended phrase.

Applicants respectfully traverse the rejection and submit that the phrase is not confusing or indefinite and is in conformance with general practice (e.g., MPEP § 803.02 refers to a "single

species", which the Examiner would apparently reject). However, Applicants have amended claim 33 herein to recite "wherein at least one of the species" as suggested by the Examiner to facilitate prosecution of the application, and not for reasons of patentability.

2. The Examiner states that the expression "an arbitrary alkenyl group containing 1 to 10 carbons atoms" used to described the structure of the starting material is confusing, since at least two carbons are needed in order to have such an organic functional group and that a similar expression is used in the description of the product.

Applicants respectfully traverse the rejection for the same reasons as stated above in regard to the rejection of claim 30 (see paragraph b2 above). Applicants have amended claim 33 herein to recite "an arbitrary alkenyl group containing 2-10 carbon atoms" and "a C_2-C_{10} alkenyl group" to remove any ambiguity in the claim language.

3. The Examiner states that the phrase "producing a hydrogenated ester" describes the product as one wherein the alkene group has been hydrogenated. However such product can have an alkenyl functional group and therefore not be a "hydrogenated ester" as previously described. The Examiner asks, "Is the product hydrogenated or unsaturated ?", "What are the functional groups affected by the claimed process ?" and "What is the product obtained in the claimed process ?"

Applicants respectfully traverse the rejection on the basis that one of ordinary skill in the art would understand the meaning and scope of the claim when read in light of the specification and in light of the general knowledge and skill in the art as previously discussed in relation to claim 30. Accordingly, Applicants respectfully request withdrawal of the rejection.

d) Claims 31 and 33:

The Examiner states that the presence of the groups R^7 to R^{11} in the formula (2), which is used to describe the product is confusing since the groups R^1 to R^5 are not present in the product but the claimed process is not directed to alternate or transformed groups because it is a hydrogenation reaction, which is suppose to only add hydrogen and not to affect other groups.

Applicants respectfully traverse the rejection and submit that as long as the substituents are properly defined such that one of ordinary skill in the art would be able to understand and practice the scope of the claimed invention the claim is definite within the meaning of 35 U.S.C. § 112, 2nd paragraph. Since the definition of the substituent groups of the product correspond to the definition of the substituent groups of the starting material, the claim language is definite. Accordingly, Applicants respectfully request withdrawal of the rejection.

e) Claim 32:

The Examiner asserts that claim 32 is indefinite allegedly because it contains a broad limitation together with a narrow limitation that falls within the broad limitation in the same claim. Specifically, the Examiner refers to the phrase "hydrogenating catalyst selected from at least one metal selected from the group consisting of Group VIII, Group IX and Group X elements in the periodic table", as the broad recitation and the phrase "is at least one species selected from the group consisting of palladium, ruthenium, and rhodium" as the narrower statement of the limitation.

Applicants respectfully traverse the Examiner's rejection on the basis that one of ordinary skill in the art would understand from the plain language of the claims that claim 32 further

limits the element of "the hydrogenated catalyst selected from at least one metal selected from the group consisting of Group VIII elements, Group IX elements, and Group X elements in the periodic table" recited in claim 31.

II. Claim Rejections Under 35 USC § 102

1. Russell et al

Claims 30, 7 and 8 are rejected under 35 U.S.C. 102(b) as allegedly being anticipated by Russell et al, Journal of Organic Chemistry, vol. 36, no. 14,1971. The Examiner asserts that Russell et al disclose a process directed to a reduction of unsaturated compounds having oxygen. Russell's process comprises a reaction mixture having:

100 mmol substrate to be hydrogenated as allyl acetate,

50 ml of 95 % ethyl alcohol containing, and

50 mg of the prepared catalyst comprising Nickel.

Applicants traverse the rejection and submit that the reference does not teach all of the elements of the claimed invention and therefore cannot anticipate the claimed invention. Russell et al. (Journal of Organic Chemistry, 36 (14), 2018 (1971)) discloses a process wherein allyl acetate is hydrogenated by using a nickel catalyst. Russell does not teach or suggest a process wherein an unsaturated group-containing ester of formula (1) is hydrogenated at a concentration of the unsaturated group-containing ester at the initial time of the hydrogenation reaction in the range of 1 wt % - 50 wt % while the unsaturated group-containing ester is diluted with recycled hydrogenated ester.

2. Xiangkai et al

Claims 30, 6, 7 and 8 are rejected under 35 U.S.C 102 (b) as allegedly being anticipated by Xiangkai et al, Cuiha Xuebao (1996), 17, 3, 260-262. According to the Examiner, Xiangkai discloses a method to hydrogenate unsaturated compounds, among them vinyl acetate. Such hydrogenation of vinyl acetate comprises:

5 mmol of substrate as vinyl acetate in order to obtain ethyl acetate,

17 ml of methanol as a solvent,

0.1 g of a catalyst comprising Pd, and

heating reaction mixture at 40°C (see page 261 Table 2 and Reaction conditions at the bottom of such Table 2).

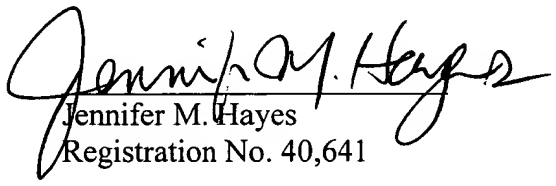
Xiangkai, et al (Chinese Journal of Catalysis, 17 (3), 260 (1996)) disclose a process wherein vinyl acetate is hydrogenated by using an amorphous Zr catalyst. The reference does not teach or suggest a process wherein an unsaturated group-containing ester of formula (1) is hydrogenated at a concentration of the unsaturated group-containing ester at the initial time of the hydrogenation reaction in the range of 1 wt % - 50 wt % while the unsaturated group-containing ester is diluted with recycled hydrogenated ester.

III. Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

Applicant hereby petitions for any extension of time which may be required to maintain the pendency of this case, and any required fee, except for the Issue Fee, for such extension is to be charged to Deposit Account No. 19-4880.

Respectfully submitted,



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APPENDIX

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Claims 3 and 15-18 are canceled.

The claims are amended as follows:

4. (Amended) ~~A~~ The process for producing a hydrogenated ester according to claim 3, wherein the corresponding hydrogenated ester is a portion or the entirety of the recycled hydrogenated ester which has been produced by the hydrogenation reaction of the unsaturated group-containing ester represented by the general formula (1).

6. (Thrice Amended) ~~A~~ The process for producing a hydrogenated ester according to claim 2, wherein the reaction temperature at the time of the hydrogenation reaction is in the range of 0°C to 200°C.

7. (Thrice Amended) ~~A~~ The process for producing a hydrogenated ester according to claim 2, wherein that unsaturated group-containing ester represented by the general formula (1) is at least one compound selected from the group consisting of: allyl acetate, crotyl acetate, methallyl acetate, allyl propionate, crotyl propionate, methallyl propionate, vinyl acetate, vinyl propionate, 1,3-butadienyl acetate, and 1,3-butadienyl propionate.

8. (Thrice Amended) ~~A~~ The process for producing a hydrogenated ester according to claim 2, wherein the hydrogenating catalyst comprises at least one element selected from the group consisting of Group VIII elements, Group IX elements or Group X elements in the periodic table.

9. (Thrice Amended) ~~A~~ The process for producing a hydrogenated ester according to claim 30, wherein the hydrogenation reaction is conducted by a liquid-phase reaction by use of a fixed bed-type reactor.

10. (Twice Amended) A process for producing a hydrogenated ester by hydrogenating an allyl-type ester represented by a general formula (1) (n=1) by using a hydrogenating catalyst so as to produce ~~a~~ the corresponding hydrogenated ester corresponding to the allyl-type ester, wherein the concentration of a carboxylic acid in a raw material containing the allyl-type ester represented by the general formula (1) is 1 wt. % or less.

11. (Twice Amended) ~~A~~ The process for producing a hydrogenated ester according to claim 10, wherein the hydrogenating catalyst comprises at least one species selected from the group consisting of compounds of Group VIII elements, Group IX elements or Group X elements in the periodic table.

12. (Twice Amended) ~~A~~ The process for producing a hydrogenated ester according to claim 11, wherein the hydrogenating catalyst comprises at least one species selected from the group consisting of compounds of palladium, rhodium or ruthenium.

13. (Thrice Amended) ~~A~~ The process for producing a hydrogenated ester according to claim 10, wherein the allyl-type ester represented by the general formula (1) is at least one species of allyl-type ester selected from the group consisting of allyl acetate, crotyl acetate, methallyl acetate, allyl propionate, crotyl propionate, and methallyl propionate.

24. (Amended) ~~A~~ The process for producing a hydrogenated ester according to claim ~~19~~31, wherein the hydrogenation is carried out at a reaction temperature in the range of 0° to 200°C.

25. (Amended) ~~A~~ The process for producing a hydrogenated ester according to claims ~~20~~33, wherein the hydrogenation is carried out at a reaction temperature in the range of 0° to 200° C.

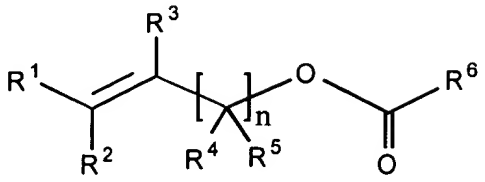
26. (Amended) ~~A~~ The process for producing a hydrogenated ester according to claim ~~19~~31, wherein the unsaturated group-containing ester as a raw material is diluted with an inert solvent and the resultant diluted liquid is used as the raw material-containing a liquid to be hydrogenated.

27. (Amended) ~~A~~ The process for producing a hydrogenated ester according to claim ~~20~~33, wherein the unsaturated group-containing ester as a raw material is diluted with an inert solvent and the resultant diluted liquid is used as the raw material-containing liquid to be hydrogenated.

28. (Amended) ~~A~~ The process for producing a hydrogenated ester according to claim ~~23~~25, wherein the inert solvent is a hydrogenated ester corresponding to the unsaturated group-~~consisting~~ containing ester as a raw material.

29. (Amended) ~~A~~ The process for producing a hydrogenated ester according to claim 24, wherein the inert solvent is a hydrogenated ester corresponding to the unsaturated group-containing ester as a raw material.

30. (Amended) A process for producing a hydrogenated ester by hydrogenating an unsaturated group-containing ester represented by the following general formula (1) in the presence of a hydrogenating catalyst so as to produce ~~a~~ the corresponding hydrogenated ester corresponding to the unsaturated group-containing ester



(1)

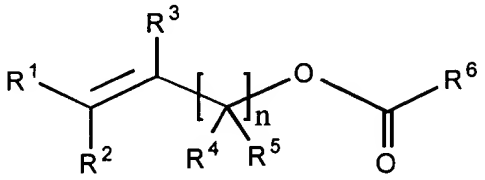
wherein R^1, R^2, R^3, R^4 and R^5 denote an arbitrary alkyl group containing 1-10 carbon atoms, an arbitrary alkenyl group containing ~~1~~ 2 - 10 carbon atoms, or a hydrogen atom and may be the same as or different from each other; the alkyl group and alkenyl group may be either straight-chain or branched; R^6 denotes an arbitrary alkyl group which contains 1 - 10 carbon atoms and may be either straight-chain or branched; and n is 0 or 1, comprising

providing an unsaturated group-containing ester represented by the general formula (1), wherein the concentration of the unsaturated group-containing ester represented by general formula (1) at the initial time of the hydrogenation reaction thereof is in the range of 1 wt % -50 wt % based on the entirety of the raw material liquid containing the unsaturated group-containing ester; and

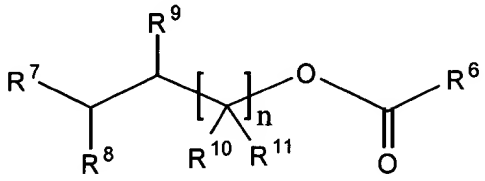
reacting the unsaturated group containing ester with hydrogen while ~~by~~ diluting said unsaturated group-containing ester with an inert solvent to effectuate a hydrogenation reaction, wherein the inert solvent is the corresponding hydrogenated ester.

31. (Amended) A process for producing a hydrogenated ester, wherein an unsaturated group-containing ester represented by the general formula (1) is hydrogenated by using a hydrogenating catalyst which contains at least one metal selected from the group consisting of Group VIII elements, Group IX elements, and Group X elements in the periodic table, and is to be used for hydrogenating an unsaturated group-containing ester represented by

the following formula (1) to thereby produce a hydrogenated ester represented by the following formula (2), wherein the catalyst has an acidity of 1.0×10^{-1} mol/g or less:



(1)

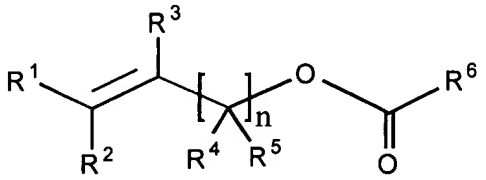


(2)

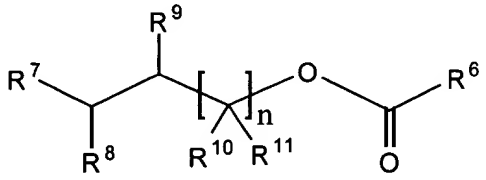
wherein n represents 0 or 1; R^1, R^2, R^3, R^4 and R^5 denote an arbitrary alkyl group containing 1-10 carbon atoms, an arbitrary alkenyl group containing ~~1~~ 2 - 10 carbon atoms, or a hydrogen atom and may be the same as or different from each other; the alkyl group and alkenyl group may be either straight-chain or branched; R^6 represents a C_1-C_{10} alkyl group; and each of R^7, R^8, R^9, R^{10}, and R^{11} represents a C_1-C_{10} alkyl group, a ~~C_1~~C_2-C_{10} alkenyl group, or a hydrogen atom independently to each other.

32. (Amended) ~~A~~ The process for producing a hydrogenated ester according to claim 31, wherein the hydrogenating catalyst selected from at least one metal selected from the group consisting of Group VIII elements, Group IX elements, and Group X elements in the periodic table is at least one of the species selected from the group consisting of palladium, ruthenium and rhodium.

33. (Amended) A process for producing a hydrogenated ester, wherein at least one of the species of an unsaturated group-containing ester selected from the group consisting of allyl acetate, crotyl acetate, methallyl acetate, allyl propionate, crotyl propionate, methallyl propionate, vinyl acetate, 1,3-butadienyl acetate, 1-methyl-1-propenyl acetate, vinyl propionate, 1,3-butadienyl propionate, and 1-methyl-1-propenyl propionate is hydrogenated by using a hydrogenating catalyst which contains at least one metal selected from the group consisting of Group VIII elements, Group IX elements, and Group X elements in the periodic table, and is to be used for hydrogenating an unsaturated group-containing ester represented by the following formula (1) to thereby produce a hydrogenated ester represented by the following formula (2), wherein the catalyst has an acidity of 1.0×10^{-1} mol/g or less:



(1)



(2)

wherein n represents 0 or 1; R^1, R^2, R^3, R^4 and R^5 denote an arbitrary alkyl group containing 1-10 carbon atoms, an arbitrary alkenyl group containing ~~1~~ 2 - 10 carbon atoms, or a hydrogen atom and may be the same as or different from each other; the alkyl group and alkenyl group may be either straight-chain or branched; R^6 represents a C_1-C_{10} alkyl group; and each of R^7, R^8,

R^9, R^{10}, and R^{11} represents a C_1-C_{10} alkyl group, a ~~C_1~~C_2-C_{10} alkenyl group, or a hydrogen atom independently to each other.

34. (Amended) ~~A~~ The process for producing a hydrogenated ester according to claim 33, wherein the hydrogenating catalyst selected from at least one metal selected from the group consisting of Group VIII elements, Group IX elements, and Group X elements in the periodic table is at least one of the species selected from the group consisting of palladium, ruthenium and rhodium.